

Appl. No. 10/753,318
Amendment dated: January 11, 2006
Reply to OA of: September 12, 2005

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1(currently amended). A method of forming a plurality of bumps on a wafer having an active surface, wherein the wafer further comprises a plurality of bonding pads formed on the active surface and a passivation layer formed on the active surface to expose the bonding pads, the method comprising the steps of:

forming an under bump metallurgy layer over the active surface of the wafer, wherein the under bump metallurgy layer comprises an adhesive layer and an electrically conductive layer disposed on the adhesive layer and covering the bonding pads and the passivation layer;

removing portions of the electrically conductive layer ~~without being~~ not disposed above the bonding pads to leave un-removed portions of the electrically conductive layer on the bonding pads;

forming a plurality of bumps on the un-removed portions of the electrically conductive layer; and

removing portions of the adhesive layer ~~without being~~ not covered by the bumps ~~and the un-removed portions of the electrically conductive layer~~ by an etchant, wherein the etchant is an sulfuric acid solution and the concentration of the sulfuric acid solution ranges from about 50% to about 96%.

2(original). The method of claim 1, wherein the adhesive layer is made of a material selected from one of titanium and copper.

3(canceled).

4(original). The method of claim 1, wherein the step of removing the adhesive

layer is performed at a temperature ranging from about 60°C to about 90°C.

5(original). The method of claim 1, wherein the under bump metallurgy layer comprises a titanium layer, a nickel-vanadium layer and a copper layer.

6(original). The method of claim 1, wherein the adhesive layer comprises an aluminum layer.

7(original). The method of claim 1, wherein the step of forming the bumps comprises forming a photo-resist layer on the electrically conductive layer to expose the un-removed portions of the electrically conductive layer to form a plurality of openings, filling a solder material into the openings, and removing the photo-resist layer.

8(original). The method of claim 7, wherein the solder material is filled into the openings by the method of plating.

9(currently amended). A method of forming a plurality of bumps on a wafer having an active surface, wherein the wafer further comprises a plurality of bonding pads formed on the active surface and a passivation layer formed on the active surface to expose the bonding pads, the method comprising the steps of:

forming an under bump metallurgy layer over the active surface of the wafer, wherein the under bump metallurgy layer comprises an adhesive layer and an electrically conductive layer disposed on the adhesive layer and covering the bonding pads and the passivation layer;

forming a plurality of bumps on portions of the electrically conductive layer disposed above the bonding pads;

removing residual portions of the electrically conductive layer ~~without being~~ not covered by the bumps; and

removing portions of the adhesive layer ~~without being~~ not covered by the bumps

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through an etchant, wherein the etchant is a sulfuric acid solution and the concentration of the sulfuric acid solution ranges from about 50% to about 96%.

10(original). The method of claim 9, wherein the adhesive layer is made of a material selected from one of titanium and copper.

11(canceled).

12(original). The method of claim 9, wherein the step of removing the adhesive layer is performed at a temperature ranging from about 60°C to about 90°C.

13(original). The method of claim 9, wherein the under metallurgy layer comprises a titanium layer, a nickel-vanadium layer and a copper layer.

14(original). The method of claim 9, wherein the adhesive layer comprises an aluminum layer.

15(original). The method of claim 9, wherein the step of forming the bumps comprises forming a photo-resist layer on the electrically conductive layer to expose portions of the electrically conductive layer disposed above the bonding pads to form a plurality of openings, filling a solder material into the openings, and removing the photo-resist layer.

16(original). The method of claim 15, wherein the solder material is filled into the openings by the method of plating.

17(currently amended). The method of claim 9, further comprising a reflowed process to shape the bumps into a ball-like shape after the portions of the adhesive layer ~~without being~~ not covered by the bumps are removed.

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18(original). The method of claim 9, wherein the bumps comprises solder bumps.

19(original). The method of claim 9, wherein the bumps comprises lead-free solder bumps.